

**SECTION 02751**  
**PREPARATORY CLEANING OF SEWERS**

**PART 1 - GENERAL**

**1.01 SCOPE OF WORK**

- A. This section covers the preparatory cleaning of designated sewer lines prior to the internal inspection of the sewer lines by closed-circuit television. The Contractor shall furnish all necessary material, labor, equipment and services required for cleaning the specific sewer lines authorized by the Engineer. Arrangements shall be made with the appropriate Water Company for the purchase of water at no additional cost to the owner.

**1.02 GENERAL**

- A. Sewer line walls shall be cleaned adequately to provide for a camera used in internal inspection to discern structural defect, misalignment, and infiltration/inflow sources. Cleaning immediately prior to internal inspection is required to preclude the build-up of debris from infiltration/inflow sources and upstream manhole sections.
- B. The term "clean" as used in these Specifications shall mean the adequate removal of sand, dirt, roots, grease and other solid or semisolid materials from the sewer lines. The designated sanitary sewer manhole sections shall be cleaned using mechanically powered, hydraulically propelled or high velocity sewer cleaning equipment, as specified.
- C. Hydraulic Cleaning Equipment:
  - 1. The equipment used shall be of a movable dam type and be constructed in such a way that a portion of the dam may be collapsed at any time during the cleaning operation to protect against flooding of the sewer. The movable dam shall be of equal diameter as the pipe being cleaned and shall provide a flexible scraper around the outer periphery to ensure total removal of grease. If sewer cleaning balls or other such equipment, which cannot be collapsed instantly, are used, special precautions against flooding of the sewers and public or private property, shall be taken.

D. High Velocity Hydro-Cleaning Equipment:

1. All high velocity sewer cleaning equipment shall be constructed for ease and safety of operation. The equipment shall have a selection of two or more velocity nozzles. The nozzles shall be capable of producing a scouring action from 15 degrees to 45 degrees in all size lines designated to be cleaned. Equipment shall also include a high velocity gun for washing and scouring manhole walls and floor. The gun shall be capable of producing flows from a fine spray to a long distance solid stream.

The equipment shall carry its own water tank, auxiliary engines, pumps, and hydraulically driven hose reel. All controls shall be located so the equipment can be operated above ground.

E. Mechanical Cleaning Equipment

1. Bucket machines shall be in pairs with sufficient power to perform the work in an efficient manner. Machines shall be belt operated or have an overload device. Machines with direct drive that could cause damage to the pipe will not be allowed. A power rodding machine shall be either a sectional or continuous type capable of holding a minimum of 750 feet of rod. The rod shall be specifically treated steel. To ensure safe operation, the machine shall have a fully enclosed body and an automatic safety throw-out clutch or relief valve.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 GENERAL

A. The equipment and methods selected shall be satisfactory to the Engineer's Representative. The equipment selected for cleaning shall be capable of removing dirt, grease, rocks, sand and other deleterious materials and obstructions from the sewer lines and manholes. If cleaning of an entire section cannot be successfully performed from one manhole, the equipment shall be re-setup on the other manhole and cleaning again attempted. If, again, successful cleaning cannot be performed or the equipment fails to traverse the entire manhole section, it will be assumed that a major blockage exists and the cleaning effort shall be abandoned. Blockages, if any, shall be reported to the Engineer immediately.

### 3.02 MATERIAL REMOVAL

A. All sludge, dirt, sand, rocks, grease and other solid or semisolid material resulting from the cleaning operation shall be removed at the downstream manhole of the section being cleaned. Passing material from manhole section to manhole section which could cause line stoppages, accumulations of sand in wet wells, or damage to pumping equipment shall not be permitted.

### 3.03 DISPOSAL OF MATERIALS

A. All solids or semisolids resulting from the cleaning operations shall be removed from the site and disposed of in an approved manner. All materials shall be removed from the site no less than at the end of each workday. Under NO circumstances will the Contractor be allowed to accumulate debris, etc., on the site of work beyond the stated time, except in totally enclosed containers and as approved by the Engineer.

### 3.04 CLEANING PRECAUTIONS

A. During all sewer cleaning operations, satisfactory precautions shall be taken to protect the sewer lines from damage that might be inflicted by the improper use of cleaning equipment. Whenever hydraulically propelled cleaning tools, which depend upon water pressure to provide their cleaning force or any tools which retard the flow of water in the sewer line are used, precautions shall be taken to ensure that the water pressure created does not cause any damage or flooding to public or private property being served by the manhole section involved. The flow of sewage in the sewer lines shall be utilized to provide necessary pressures for hydraulic cleaning devices whenever possible. When additional quantities of water from fire hydrants are necessary to avoid delay in normal working procedures, the water shall be conserved and not used unnecessarily. No fire hydrant shall be obstructed in case of a fire in the area served by the hydrant nor shall a hydrant be used for the purpose described unless a vacuum break is provided.

### 3.05 FINAL ACCEPTANCE

A. Acceptance of this portion of the work shall be made upon the successful completion of the television inspection and shall be to the satisfaction of the Engineer's representative. In areas where cleaning was not found satisfactory during the television inspection, that section shall be cleaned again as designated by the Engineer.

### 3.06 RECORDING OF FIELD DATA

A. For each location where cleaning is performed, a cleaning report shall be completed which shall contain the following items of information.

1. Location, size, material, and condition of the reach.
2. Length of sewer cleaned.
3. Estimated amount and types of debris and sediment removed.
4. Grease build-ups.
5. Method required for cleaning.
6. Structural failure.

B. All preparatory cleaning shall be witnessed by the Engineer or his Project Representative to insure acceptability of work performance and record-keeping procedures of the Contractor. Preparatory cleaning records shall be ratified daily by the Engineer or his Representative.

END OF DOCUMENT

**SECTION 02752**  
**TELEVISION INSPECTION OF SEWERS**

**PART 1 – GENERAL**

**1.01 SCOPE OF WORK**

- A. This section shall apply to all extensions to the public sewer system and covers the internal inspection of all the sewers by a closed-circuit television camera to observe the conditions in the sewer lines. The Sewer Inspection Contractor shall furnish all necessary material, labor, equipment, and services required for the internal inspection of 100% of the sewer lines, including but not limited to, all recording and playback equipment, material, and supplies. Inspections shall be performed in the presence of the Engineer and/or Resident Project Representative (RPR).

**1.02 RELATED WORK**

- A. Preparatory Cleaning of Sewers as specified in Section 02751.
- B. Sewer Flow Control as specified in Section 02753.

**1.03 GENERAL**

- A. The Contractor shall determine by internal inspection the location, condition, and estimated flow rate for each source of infiltration and/or inflow within each sewer section. During the inspection, all the infiltration and/or inflow sources, structural defects, service connections, abnormal conditions, and other pertinent observations shall be recorded.
- B. All inspections will be witnessed by the Engineer or his Representative and performed one manhole section at a time. The flow in the section being inspected will be controlled, as specified in Section 02753.

**1.04 EQUIPMENT**

- A. The television camera used for the inspection shall be one specifically designed and constructed for such inspection. Lighting for the camera shall be suitable to allow a clear picture for the entire periphery of the pipe. The camera shall be of a 360-degree radial view design capable of operating in 100 percent humidity conditions. The camera, television monitor, and other components of the video system shall be capable of producing a minimum 700-line resolution video picture. Picture quality and definition shall be to the satisfaction of the Engineer's representative and if unsatisfactory, shall be re-televised at the contractor's expense.
- B. All videotapes used shall be either Sony or TDK Brand in VHS format.

## PART 2 – PRODUCTS (NOT USED)

## PART 3 – EXECUTION

### 3.01 PROCEDURE

- A. The camera shall be moved through the line in either direction at a uniform rate stopping when necessary to insure proper documentation of the sewer's condition but in no case will the television camera be pulled at a speed greater than 30 feet per minute. Manual winches, power winches, TV cable, and powered rewinds or other devices that do not obstruct the camera view or interface with proper documentation of the sewer conditions shall be used to move the camera through the sewer line. If, during the inspection operation the television camera will not pass through the entire manhole section, the Contractor shall re-setup his equipment in a manner so that the inspection can be performed from the opposite manhole.
- B. Whenever non-remote powered and controlled winches are used to pull the television camera through the line, telephones, or other suitable means of communication shall be set up between the two manholes of the section being inspected to insure good communications between members.
- C. Movement of the television camera shall be temporarily halted at each visible point of interest (service line, defects, etc.) so that the radial view camera may better examine each object.

### 3.02 RECORDING OF FIELD OBSERVATIONS

- A. Television Inspection Logs:
  - 1. Information obtained shall be recorded on internal inspection logs with a format furnished or approved by the Engineer. The following information shall be recorded for each reach inspected:
    - a. Location and length of reach
    - b. Pipe size and material
    - c. Location and descriptions of service connections
    - d. Locations and descriptions of defects such as obstructions, intrusions, offset joints, hole, breaks, cracks, collapses, bends, or dips in alignment, protruding service connections, etc.
    - e. Items video-taped and/or photographed
- B. Photographs
  - 1. Instant developing, 35mm or other standard size photographs of the television monitor or problem areas shall be taken by the Contractor upon the request of the Engineer or his Representative to document unusual, questionable, or severe conditions found during the course of the work.

C. Video Tape Recording

1. The purpose of tape recording shall be to supply a visual and audio record of problem areas of the lines that may be replayed both daily and at future presentations by the Owner. All video tape recordings shall be made at standard speed (SP) for maximum clarity. Slow motion or stop motion play back features shall be supplied at the option of the Contractor. All video tapes and logs are considered property of the Owner and shall be submitted prior to release of retainage. The Owner may at their own expense perform selected or all warranty inspection prior to the end of the warranty period. The contractor shall be responsible for all the repairs necessary at that time.

- D. The Engineer or his Project Representative to insure acceptability of work and record-keeping procedures of the Contractor shall witness all television inspection. The Engineer or his Representative shall verify preparatory cleaning records.

END OF DOCUMENT

## SECTION 02753 SEWER FLOW CONTROL

### PART 1 - GENERAL

#### 1.01 SCOPE OF WORK

- A. This covers the sewer flow control procedures of plugging, blocking, and by-pass pumping. The Contractor shall provide all material, equipment, labor and services necessary to perform the work in accordance with the items of this section.

#### 1.02 RELATED WORK

- A. Preparatory cleaning of sewers as specified in Section 02751.
- B. Television Inspection as specified in Section 02752.

#### 1.03 GENERAL

- A. When sewer line flows at the manhole section being replaced are sufficient to cause a washing of the bedding or backfill material into the line then the flows shall be reduced by one of the following methods: manual operation of pumping stations; plugging/blocking of the flows; or by pumping/bypassing of the flows, as specified by the Engineer or his Representative.
- B. Sewer flows shall not exceed five (5) percent of the pipe diameter for the respective line sizes as measured in the manhole when performing television inspection.
- C. Plugging, blocking, or bypassing of the sewer flow shall be considered incidental to the work and shall not be considered for payment.

### PART 2 - PRODUCTS (Not Used)

### PART 3 - EXECUTION

#### 3.01 PLUGGING AND BLOCKING

- A. A sewer line plug shall be inserted into the line at a manhole upstream for the section being inspected. The plug shall be so designed that all or any portion of the sewage flows can be released. During the inspection portion of the operation, flows shall be shut off or reduced to within the maximum flow limits specified in 1.03 B. After the work tasks have been completed, flows shall be restored to normal.



### 3.02 PLUGGING AND BYPASSING

- A. When pumping/bypassing is required, the Contractor shall supply the necessary pumps, conduits and other equipment to divert the flow of sewage around the manhole section in which work is to be performed. The bypass system shall be of sufficient capacity to handle existing flows plus additional flow that may occur during periods of a rain storm. The Contractor will be responsible for furnishing the necessary labor and supervision to set up and operate the pumping and bypassing system. A "setup" consists of the necessary pumps, conduits, and other equipment to divert the flow of sewage around a manhole section, from the start to finish of work performed in the manhole section.

### 3.03 FLOW CONTROL PRECAUTIONS

- A. Whenever flows in a sewer line are blocked, plugged or bypassed, sufficient precautions must be taken to protect the sewer lines from damage that might be inflicted by excessive sewer surcharging. Further, precautions must be taken to ensure that sewer flow control operations do not cause flooding or damage to public or private property being served by the sewers involved. Damage to said properties shall be the sole responsibility of the Contractor.

END OF DOCUMENT

## SECTION 02930

### RIPRAP

#### PART 1 – GENERAL

##### 1.01 SCOPE

- A. The work covered by this section includes furnishing all labor materials, and equipment required to furnish, place, and set rock riprap, concrete block riprap, and sacked sand-cement riprap as shown on the Drawings and/or specified herein.
- B. Riprap shall be placed on slopes of embankments or other surfaces or around structures as protection against the erosive action of water.
- C. Where shown on the Drawings, a filter blanket course of crushed rock, or sand and gravel, or an approved filter fabric shall be placed under the riprap.

##### 1.02 SUBMITTALS

- A. The CONTRACTOR shall provide the ENGINEER with written evidence in the form of mill test reports from a qualified testing laboratory that all sands, cements, and filter blanket materials used conform to the applicable requirements of this Specification section.
- B. When requested by the ENGINEER, the CONTRACTOR shall furnish representative samples of rock riprap material for classification, gradation, or other tests as the ENGINEER may direct.

#### PART 2 – PRODUCTS

##### 2.01 ROCK RIPRAP

- A. Rock riprap shall be constructed using sound, dense, durable stones, or rock fragments, free from crack, pyrite intrusions and other structural defects. Stones which will be used with mortar shall be free from dirt, oil, or other material that might prevent good adhesion with the mortar. Stones with a laminated structure shall be avoided. Field stones shall not be used as a source of rock for riprap. Only rock that has been approved by the ENGINEER shall be used for riprap.
- B. When the crushed aggregate is subjected to five (5) alternations of the sodium Sulfate soundness test, the weighted percentage of loss shall be not more than 12 percent.
- C. Shape of the stones shall be generally rectangular or cubic. Flat or elongated stones having a small dimension less than 1/3 of the large dimension shall not be used.
- D. At least 50 percent of the stones or rock fragments for plain rock riprap shall Weigh 150 pounds or more. The sizes of the stones shall be well graded from the smaller to the larger.

- E. At least 90 percent of the stones or rock fragments for hand placed rock riprap shall weigh 100 pounds or more and shall be not less than 12 inches long, 12 inches deep, and 8 inches wide.

## 2.02 CONCRETE BLOCK RIPRAP

Concrete blocks for riprap shall be of the size as shown on the Drawings and shall be composed of non-reinforced Class A concrete conforming to the requirements of the section entitled "Cast-In-Place Concrete" of these Specifications..

## 2.03 SACKED SAND-CEMENT RIPRAP

- A. Sand-cement for sacked sand-cement riprap shall be composed of a dry mixture of one bag (94 pounds) of cement to 5 cubic feet of dry sand.
- B. Sacks shall be either cotton or jute, standard grade of cloth, which will hold the sand-cement mixture without leakage during handling and tamping. They shall be strong and shall be sized to hold approximately 1 cubic foot.
- C. Cement shall be Type I Portland Cement conforming to ASTM C 150.
- D. Sand shall be manufactured of natural siliceous river sand conforming to ASTM D 1073. The sand shall meet the following gradation requirements.

<u>Sieve Size</u>	<u>Total Percent Passing by Weight</u>
4	100
8	95-100
30	50-80
50	30-60
100	8-25
200	2-10

- D. Sand shall be clean, hard, and free from excessive organic matter.

## 2.04 GROUT

- A. Grout for grouted rock riprap shall be sand cement grout composed of one part Cement to four parts sand, measured by volume, mixed thoroughly with sufficient water to make a grout of such consistency that it will flow into and completely fill the voids.
- B. Cement shall be Type I Portland Cement conforming to ASTM C 150.
- C. Sand shall be cleaned, hard, natural siliceous sand conforming to the requirements of ASTM C 33 and the section entitled "Cast-In-Place Concrete" of these Specifications.
- D. Water shall be fresh, clean, portable water free from injurious amounts of oil, acid, alkali, or organic matter.

## 2.05 FILTER BLANKET MATERIAL

- A. Filter blanket material shall consist of fragments of sound, durable stone or crushed rock, free from disintegrated stone, alkali, salt, vegetable matter, or adherent coating. Aggregate shall be reasonably free from thin or elongated pieces. The percentage of wear of the aggregate as outlined AASHTO Test No. T-96 shall not exceed 7 percent.
- B. Aggregate shall have the following gradation:

<u>Sieve Size</u>	<u>Total Percent Passing by Weight</u>
1-1/4"	100
1"	95-100
3/4"	70-100
3/8"	50-85
No. 4	33-65
No. 10	20-45
No. 40	8-25
No. 200	0-10

- C. The material finer than the No. 10 sieve shall be of such characteristics and gradation that will prevent the mass from setting up or becoming cemented together. Stone or crushed rock meeting the requirements of the section entitled "Mineral Aggregate Base" of these Specifications may be used provided the percentage of aggregate passing the No. 100 sieve is less than 10 percent.

## PART 3 – EXECUTION

### 3.01 EQUIPMENT

- A. All equipment necessary for the satisfactory performance of the work shall be on hand and approved by the ENGINEER before construction will be permitted to begin.
- B. The equipment shall include wooden or metal tamps of sufficient weight and number to properly compact the slopes on which the riprap or slope pavement is to be placed.
- C. Wooden hand tamps, having a tamping face not greater than 1 square foot, and of sufficient weight and number to properly tamp the riprap, shall be furnished when sacked sand-cement is used.
- D. Equipment for mixing cement grout or sand cement shall include a mechanical mixer or, if the ENGINEER approves hand mixing for cement grout, a watertight mixing platform or mixing box of adequate size.

### 3.02 PREPARATION OF FOUNDATION

- A. Immediately prior to the construction of riprap, the slopes or ground surface shall be trimmed within reasonably close conformity to the lines and grades indicated on the Drawings or as directed by the ENGINEER, and shall be thoroughly compacted by the use of hand or mechanical tamps.
- B. On slopes, the bottom of the riprap shall be placed at least 2 feet below the natural ground surface, unless otherwise shown or directed.
- C. No material shall be placed on a frozen or otherwise unsuitable slope.

### 3.03 PLACEMENT OF FILTER BLANKET

- A. Where shown on the Drawings, a filter blanket course shall be placed under the riprap on the prepared subgrade.
- B. Filter blanket shall be placed immediately prior to placement of riprap. Compaction of the filter blanket is not required except where called for on the Drawings.
- C. Where specifically permitted by the ENGINEER, a synthetic filter fabric may be substituted for the filter blanket course. Filter fabric shall be especially designed for use as slope stabilization under riprap and shall be acceptable to the ENGINEER. Placement of filter fabric shall be in strict conformance with the manufacturer's written instructions and recommendations.

### 3.04 MACHINE CONSTRUCTION OF PLAIN ROCK RIPRAP

- A. Unless otherwise shown on specified, plain rock riprap shall be constructed using a crane and clam-shell or other suitable equipment approved by the ENGINEER. The rock shall be placed as nearly as practicable in final position using powered equipment. If necessary, larger rocks shall be worked up to the surface when the material on the surface does not meet the weight specification or when the voids next to the foundation material are too large.
- B. The quantity of small stones shall be kept as low as possible, sufficient only to fill the voids between the larger stones. Care shall be taken that this small material is well distributed throughout the mass and not allowed to segregate or form pockets of small stone. All bridging shall be broken down. Large interstices, or open channels, or voids shall be filled by chinking or otherwise manipulating the stones.
- C. When riprap is to be built on existing riprap, special care shall be taken to provide positive anchorage of the new riprap to the existing riprap.
- D. The finished riprap surface shall in general conform to the slope lines shown on the Drawings. No objectionable, hazardous, or unsightly projections above the general place surface will be permitted.

### 3.05 CONSTRUCTION OF HAND PLACED, PLAIN ROCK RIPRAP

- A. Hand placed plain rock riprap shall be constructed upon the prepared foundation by hand placing so that the stones shall be as close together as is practicable in order to reduce the voids to a minimum. Construction of riprap on sloped surfaces shall begin horizontal layers.
- B. When rock riprap is constructed in more than one layer, it shall be so placed that it will be thoroughly tied together with the larger stones protruding from one layer into the other.
- C. The standard depth of rock riprap shall be 12 inches unless otherwise indicated or directed and in no instance shall be less than 10 inches in depth. Rock riprap shall have an average depth for each 25 square feet of surface of not less than the depth indicated on the Drawings or directed by the ENGINEER, or the standard depth required in these Specifications.
- D. Each stone shall be so placed that the depth will be perpendicular to the surface upon which it is set. The length shall be placed so that it will be against the adjoining stones. The stones shall be placed in such a manner as to stagger all joints as far as it is possible and practicable.
- E. The main stones shall be thoroughly chinked and filled with the smaller stones by throwing them over the surface in any manner that is practicable for the smaller stones to fill the voids. This work shall continue with the progress of the construction. Tamping of the stones will not be required if the stones have been placed in a reasonable and satisfactory manner.
- F. Knapping of the stones will not be required except stone protruding more than 4 inches above what is considered the normal surface of the stones, in which case these stone shall be broken down to come within 4 inches of the normal surface.

### 3.06 CONSTRUCTION OF GROUTED ROCK RIPRAP

- A. Grouted rock riprap shall constructed upon the prepared foundation using hand placement and the stone shall be set or placed are close together as is practicable in order to reduce the voids to a minimum. Construction of riprap on slopes shall begin at the bottom and shall progress upward in approximately horizontal layers.
- B. When rock riprap is constructed in layers, the layers shall be thoroughly tied together with large stones protruding from one layer into the other.
- C. The standard depth of rock riprap shall be 12 inches, unless otherwise indicated or directed, and in no instance shall be less than 10 inches in depth. Rock riprap shall have an average depth for each 25 square feet of not less than the depth indicated on the Drawings or as directed by the ENGINEER, or the standard depth required in these Specifications.

- D. Each stone shall be bedded with the depth perpendicular to the surface upon which it is set. The length shall be placed as directed by the ENGINEER and each main stone shall be placed against the adjoining stones with sides and ends in contact. The stone shall be placed in such a manner as to stagger all joints as far as it is possible.
- E. After a workable area of the riprap has been set, the stones shall be knapped to a uniform surface and voids shall be thoroughly chinked and filled with smaller stones and spalls. This work shall continue with the progress of the construction.
- F. The surface of the completed rock riprap shall not vary from the theoretical surface required by more than 2 inches at any point when tested with a 12-foot straightedge.
- G. After chinking and filling, the voids between the stones shall be completely filled with grout. Care shall be taken to prevent earth or sand from filling the spaces between the stones before the grout is poured.
- H. This grout shall be mixed either in a one-bag mixer or larger, for not less than 1-1/2 minutes, or it may be mixed by hand in a watertight box of sufficient capacity to accommodate a batch of at least one bag of cement. Hand mixing shall be continued in a manner and for a period satisfactory to the ENGINEER.
- I. Immediately before pouring the grout, the stones shall be wetted by sprinkling. The grout shall be carefully poured into the voids between the stones. This work shall begin at the lower portions of the riprap and progress upward. The entire bottom line of voids shall be filled with grout before the next line of voids above is poured. The pouring of the grout shall be accomplished by the use of vessels of adequate size and shape. Broadcasting, slopping, or spilling of grout from the vessels on the surface of the riprap will not be permitted. Progress of pouring shall be sufficiently slow to prevent the grout from oozing from the voids and flowing over the surface. During the pouring operations and continuing until the grout has assumed its initial set fiber brooms shall be used to maintain a uniform distribution over the entire surface. The grouting operations shall continue until such a time as all the voids have been completely filled and the grout has set even with the surface of the riprap.
- J. As soon as any section of the grouted riprap has hardened sufficiently, it shall be cured by sprinkling with water until it has been covered with burlap, cotton or jute mats, earth or liquid-membrane forming compound. The mats or earth shall be maintained by soaking with water for a period of not less than 72 hours. The water used for wetting and curing the grouted riprap shall be free from salt or alkali.

### 3.07 CONSTRUCTION OF CONCRETE BLOCK RIPRAP

- A. Concrete blocks for riprap shall be constructed to the dimensions shown on the Drawings and in accordance with the applicable provisions of the section entitled "Cast-In-Place Concrete" of these Specifications.
- B. The concrete blocks shall be placed upon the prepared foundation by hand. Each block shall be bedded with the depth perpendicular to the surface upon which it is set, or placed and oriented as directed by the ENGINEER. Each block shall be placed against the adjoining blocks with sides and ends in contact. The blocks shall be placed in a manner that the joint will be staggered.
- C. The surface of the completed concrete block riprap shall not vary from the desired theoretical plane by more than ½ inch for adjoining blocks and by more than 2 inches at any point when tested with a 12-foot straightedge.

### 3.08 CONSTRUCTION OF SACKED SAND-CEMENT RIPRAP

- A. Sacked sand-cement riprap shall be constructed by placing sacks filled approximately  $\frac{3}{4}$  full with a mixture of sand and cement on the prepared foundation. Sand and cement shall be mixed dry, with a mechanical mixer until the mixture is uniform in color. After the mixing has been completed, the sand-cement mixture shall be poured into sacks of approximately 1 cubic foot capacity until they are approximately  $\frac{3}{4}$  filled. The sack shall then be securely fastened with hog rings by sewing or other suitable methods that prohibit leakage of the mixture from the bags.
- B. The sacks of sand cement shall be bedded, by hand, on the prepared grade with all the fastened ends on the grade and with the joints broken. The completed riprap shall have a minimum thickness of 10 inches, measured perpendicular to the slope. The surface shall not vary more than 3 inches above or below the desired theoretical plane.
- C. The sacks shall be rammed and packed against each other and tamped on the surface in such a manner as to form close contact and secure a uniform surface. Immediately after placing and tamping the sacks of sand cement, they shall be thoroughly soaked by sprinkling with water. Water shall not be applied under high pressure.
- D. Sacks of sand cement ripped or broken in placing shall be removed and replaced before being soaked with water.

### 3.09 PROTECTION OF STRUCTURES

All structures shall be carefully protected from damage by equipment or impact of stones or blocks. All damage shall be corrected by the CONTRACTOR at his own expense and in a manner acceptable to the ENGINEER.



**SECTION 02951**  
**RAILROAD AND HIGHWAY CROSSINGS**

**PART 1 - GENERAL**

**1.01 SCOPE**

The work covered by this section includes furnishing all labor, materials, and equipment required to properly complete sewer and/or water pipeline construction under railroads and Federal or State highways, as described herein and/or shown on the Drawings.

**1.02 SHOP DRAWINGS AND ENGINEERING DATA**

Complete Engineering data and product information shall be submitted to the Engineer in accordance with the requirements of the section entitled "Submittals" of these Specifications.

**1.03 STORAGE AND DELIVERY**

All materials shall be stored and protected with strict conformance to the manufacturer's recommendations and as approved by the Engineer.

**PART 2 - PRODUCTS**

**2.01 MATERIALS**

- A. Steel casing pipe for sizes 6 inches and smaller shall conform to ASTM A-120 (standard weight), of the latest standard specifications.
- B. Steel casing pipe, sizes 8 inches through 54 inches, shall be spiral or straight seam welded steel pipe conforming to the latest revisions to ASTM A-139 Grade B.
- C. All steel casing pipe shall be bituminous coated inside and out.
- D. All corrugated metal casing pipe shall be hot dipped galvanized.
- E. Corrugated metal casing pipe shall conform to the following specifications depending on the type of crossing:
  - 1. HIGHWAY
    - a. Corrugated pipe material shall conform to the latest revision of ASTM A-444 (AASHTO M218).
    - b. The pipe shall be single riveted with circumferential (annular) seams and a full circular cross section.
    - c. the corrugations shall be 2-3/4-inch pitch by 1/2-inch depth.

- d. The minimum material thickness (including galvanizing) shall be 20 gauge or as specified in the Bid Schedule.
- e. All joints shall be connected with the standard type single piece band connector of the same material and coating as the pipe.
- f. All corrugated metal pipe shall conform to the latest revision of AASHTO M 190.

## 2. RAILROAD

- a. Corrugated metal pipe material shall conform to the latest revision of ASTM A-444.
  - b. The pipe shall be single riveted with circumferential (annular) seams and a full circular cross section.
  - c. The pipe shall have Class I corrugations and have a minimum material thickness of 18 gauge or as specified on Drawings or Bid Schedule.
  - d. All joints shall be connected with corrugated coupling bands fabricated of the same material as the pipe.
  - e. The pipe shall be coated with a bituminous coating.
  - f. All corrugated metal pipe and Bituminous Coating shall conform to the latest revision of the American Railway Engineering Association (AREA) Manual, Volume 1, Chapter 1, Part 4.
- F. Structural steel liner plates shall be used for excavated tunnels where the casing pipe is 54 inches or greater in diameter. Liner plates shall be of the thickness shown on the Drawings. Liner plates shall be of the two-flange, lap-joint type. All liner plates shall be hot-dipped galvanized in accordance with AREA 1-4-25 or AASHTO M167 and liner plates for railroad crossings shall be bituminous coated in accordance with AREA 1-4-13. The corrugations shall be 3-1/2 inches center to center. Bolts and nuts used shall be a minimum of 5/8-inch in diameter and shall conform to the latest revision of ASTM A307 for plate thickness less than 0.209 inch, and ASTM A449 for plate thickness equal to or greater than 0.209 inch. Each plate shall have one 2-inch diameter half coupling and plug for grouting.
- G. The sand fill between the casing pipe and carrier pipe, where permitted, shall conform to the section entitled "Cast-In-Place Concrete" Part 2.02B, SECTION 03310 (Fine Aggregate) of these Specifications.
- H. The void behind the casing pipe shall be filled with sand-cement grout. The sand-cement content shall be one part Portland Cement to 3 parts fine aggregate. The water-cement ratio shall be 0.62 by weight.

## PART 3 - EXECUTION

### 3.01 GENERAL

- A. Any solidification of embankments, boring headings, or tunnel headings or sides shall be the Contractor's responsibility and shall be done at his own expense.
- B. Bored installations shall have a bored-hole diameter essentially the same as the outside diameter of the casing pipe to be installed.
- C. The casing pipe shall be jacked into the boring as soon as possible after the boring is made. Lengths of casing pipe as long as practical shall be used. Joints between sections shall be completely welded as recommended for joining the particular type of pipe.
- D. Once the jacking procedure has begun, it should be continued without stopping until completed, subject to weather and conditions beyond the control of the Contractor.
- E. Any replacement of carrier pipe in an existing casing shall be considered a new installation, subject to the applicable requirements of these Specifications.
- F. Open cut installations, where permitted, shall be in accordance with the details and procedures shown on the Drawings. For open cut installations, corrugated metal pipe may be substituted for casing pipe.
- G. Steel liner plates shall be installed in excavated tunnels when called for on the Drawings. The liner plates shall be installed progressively as excavation proceeds. Excavation shall not continue more than 24 inches past the end of the liner plate already in place. At this time an additional section of liner shall be installed before excavation shall continue. Grout shall be placed under pressure in the annular void as the excavation proceeds. Grout should be continuously placed as close to the heading as possible, using grout stops if necessary. Grout shall be injected in the lower holes first, moving upward as the back space is filled. Threaded plugs shall be installed after filling each grout hole.
- H. Care shall be taken to ensure that casing pipe installed by the boring and jacking method will be at the proper alignment and grade.
- I. The Contractor shall maintain and operate pumps, well points, and drainage system equipment to keep work de-watered at all times.
- J. Adequate sheeting, shoring, and bracing for embankments, operating pits, and other appurtenances shall be placed and maintained to ensure that work proceeds safely and expeditiously. Upon completion of the required work, the sheeting, shoring and bracing shall be left in place, cut off, or removed, as designated or directed by the Engineer.

- K. Trench excavation; mining for tunnels; all classes and types of excavation; the removal of rock, muck, debris; the excavation of all working pits; and backfill requirements of the section entitled "Earthwork" are included under this section.
- L. Carrier pipe for all lines 6 inches and larger shall have push-on joints and fittings.
- M. After the casing pipe or tunnel liner is installed; the carrier pipe shall be installed exercising care at all times to protect the interior of the casing pipe and to maintain tight, full seated joints in the carrier pipe. The carrier pipe shall be installed at the proper line and grade without any sags or high spots.
- N. The carrier pipe shall be held concentric with the casing pipe by the use of hardwood blocks or cast iron chocks spaced radially around the pipe and secured together so that they remain firmly in place. The spacing of such blocks longitudinally in the casing pipe shall not be greater than 10 feet.
- O. Except where prohibited, sand shall be forced under pressure into the annular space between the carrier pipe and the casing pipe. This shall begin at the center of the crossing and completely fill the space to each end. Care shall be exercised at all times to maintain the carrier pipe at its proper line and grade.

### 3.02 RAILROAD CROSSINGS

- A. The Contractor shall secure permission from the railroads to schedule work so as not to interfere with the operation of the railroads. All work will be done under the supervision of the Engineer and the railroads involved. The Contractor will furnish the railroad with such additional insurance as may be required, cost of the same to be borne by the Contractor.
- B. The casing pipe shall extend no less than 25 feet from the centerline of outside track to the end of the pipe. The casing pipe shall extend beyond the railway right-of-way limits, if necessary, to obtain this distance.
- C. All work on railway right-of-way including necessary supporting of tracks, safety of operations, and other standard and incidental operation procedures shall be under the supervision of the appropriate authorized representative of the railway system affected, if required, and any decisions of this representative pertaining to construction and/or operations shall be final and construction must be governed by such decisions.
- D. If, in the opinion of the railway company, it becomes necessary to provide flagging protection, watchmen, removal or replacement of tracks, or the performance of any other work in order to keep the tracks safe for traffic, the Contractor shall reimburse the railroad in cash for such services, in accordance with accounting procedures agreed on by the Contractor and affected railway company before construction is started.

### 3.03 HIGHWAY CROSSINGS

- A. The Contractor shall be held responsible and accountable for the coordinating and scheduling of all construction work within the State Highway right-of-way.
- B. Work along or across the State Highway Department rights-of-way shall be under the supervision of the Engineer and State Highway Department Engineer.
- C. All water and sewer pipelines installed under paved roads and paved crossroads within the rights-of-way of the State Highway Department shall be encased. This includes, but is not limited to, all water and sewer service lines.
- D. For open trench cut installations, the Contractor shall make satisfactory arrangements to detour traffic around the area of highway where work is in progress, with minimum inconvenience placed on the traveling public. The Contractor shall provide suitable flagmen, watchmen, safety devices, and other services and facilities as may be required by the State Highway Department. The cost of the same shall be borne by the Contractor.
- E. All water and sewer lines shall have a minimum cover of 30 inches unless otherwise shown on the Drawings, but in no case shall the minimum cover be less than that required by the regulations of the highway agency involved.
- F. Unless otherwise shown, encasement shall extend 5 feet beyond the highway embankment or back of side ditch. On curbed portions of conventional highways, the casing pipe shall extend to the back of curb or sidewalk.
- G. For open trench cut installations, the Contractor shall be responsible for scheduling and coordinating all construction work. All work at one particular crossing shall be completed with the trench backfilled, compacted, and a temporary crushed stone surface provided for traffic before any work is started on another such crossing.
- H. All installations shall be done to leave free flows in drainage ditches, pipes, culverts, or other surface drainage facilities of the highway, street, or its connections.
- J. Where sodding is disturbed by excavation or backfilling operations, such areas shall be replaced by mulch sodding on slopes 5 percent or less. All slopes over 5 percent shall be replaced with block sodding. No separate payment shall be made for sodding which shall be included in the bid prices for installation of pipe.
- K. All trench excavation within the right-of-way, but not under pavement, shall be backfilled by tamping in 6-inch layers.
- L. All surplus material shall be removed from the right-of-way and the excavation finished flush with surrounding ground.
- M. Grout backfill shall be used for unused holes or abandoned pipes.

- N. Boring, jacking, or driving of carrier or casing pipes under existing highways shall be accomplished without jetting, sluicing, or wet-boring.
- O. No excavated material or equipment shall be placed on the pavement or shoulders of the highway without the express approval of the State Highway Department Engineer.
- P. In no instance will the Contractor be permitted to leave equipment (trucks, backhoes, etc.) on the pavement or shoulder overnight. Construction materials to be installed which are placed on the right-of-way in advance of construction shall be placed in such a manner as not to interfere with the safe operation of the highway.

END OF DOCUMENT